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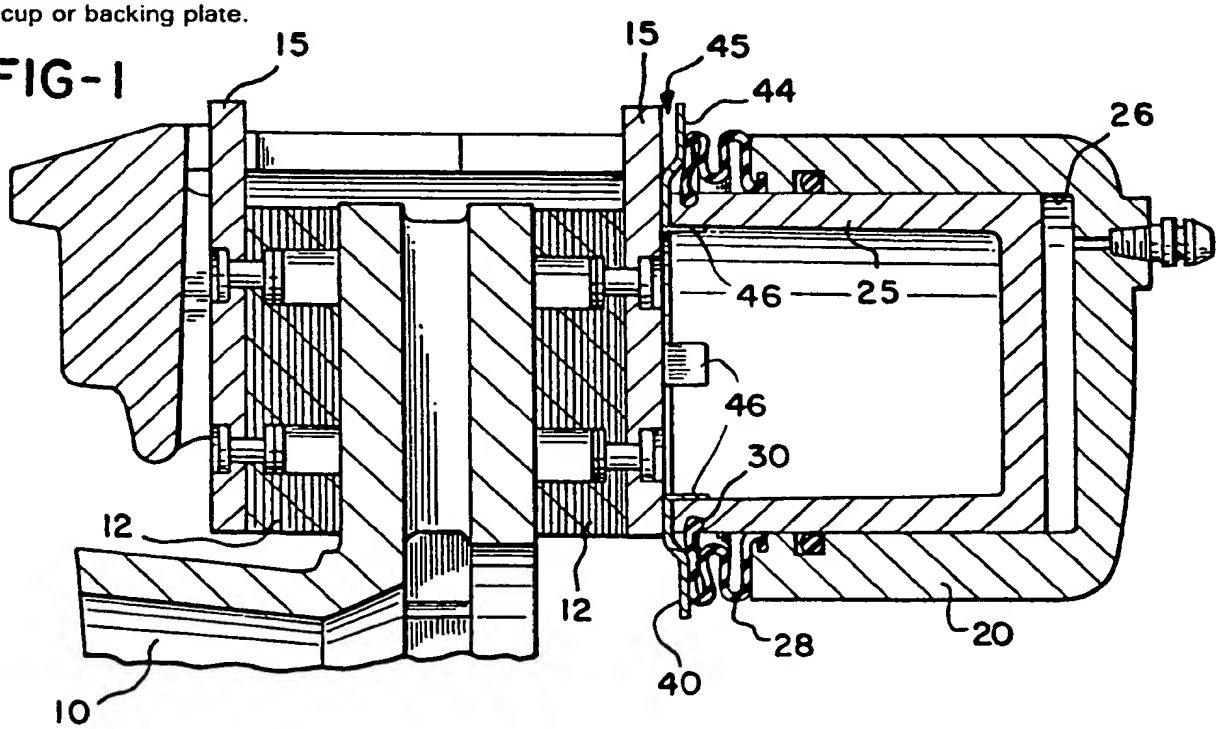
(54) Caliper-type disc brake

(57) The brake is provided with an annular sheet metal disc 40 carried on the open face of a piston cup 25 to provide a thermal barrier for the piston cup 25 and for an adjacent dust boot 28. The disc 40 has an annular portion 44 offset from the forwardmost face of the cup 25 to define a space 45 and extending adjacent the forwardmost exposed portion of boot 28 to shield boot 28 from heat and abrasion. Disc 40, preferably of stainless or galvanised sheet steel, is capable of transmitting braking force between cup 25 and backing plate 15.

Disc may be open in its centre or closed—it may have portions grippingly engaging piston cup or may be cemented or bonded thereto. In Fig. 1 disc 40 has tabs frictionally fitting on inside surface of cup: Figs. 4, 5 illustrate other attachments. Disc may be coined or embossed to limit extent to which it is in contact with cup or backing plate.

FIG-1



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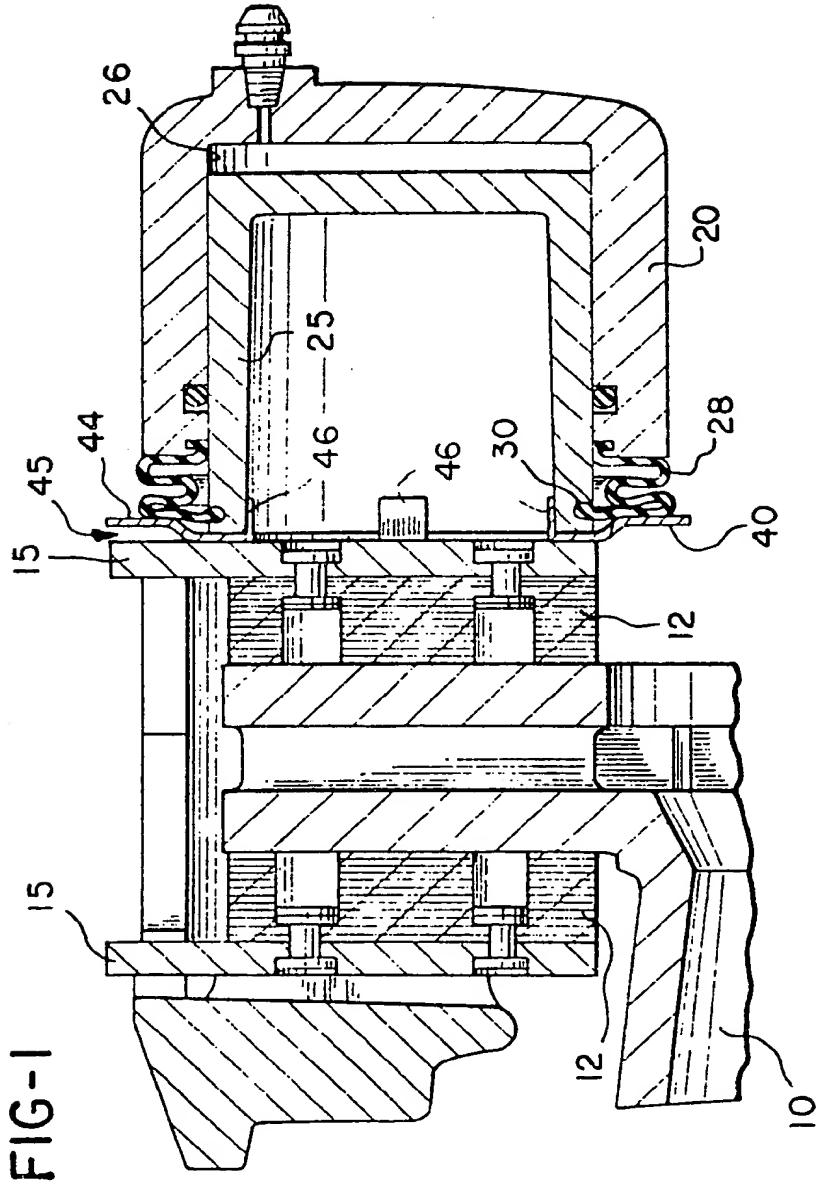


FIG-1

FIG-2

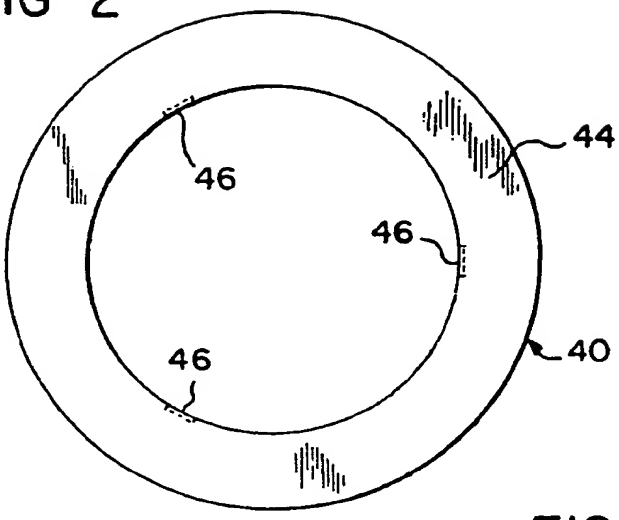


FIG-3

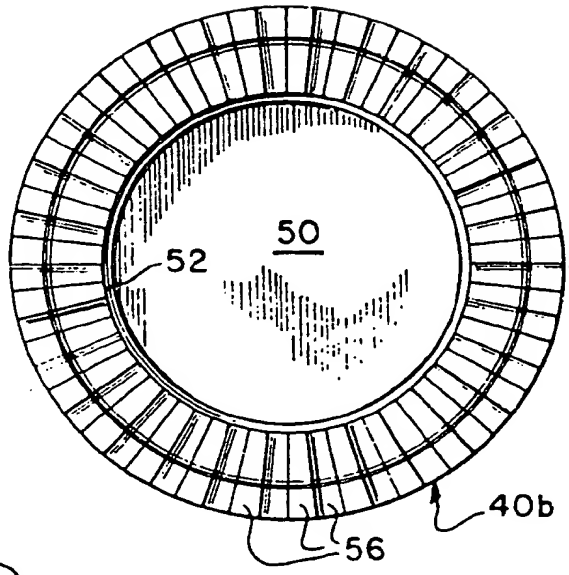


FIG-4

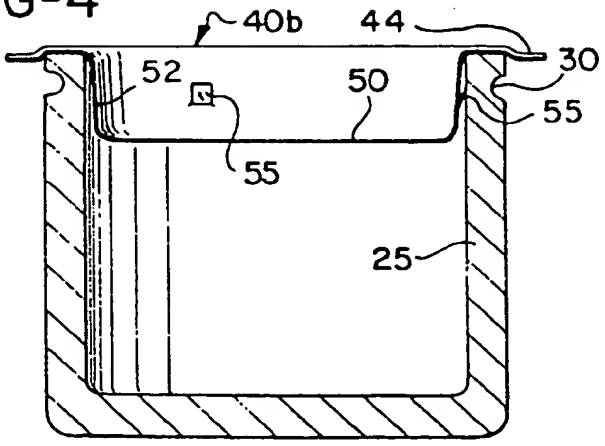
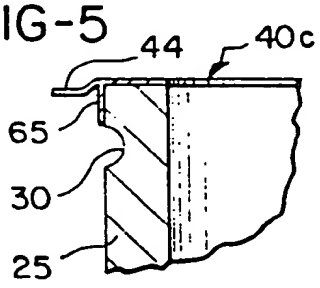


FIG-5



SPECIFICATION

Caliper-type disc brake

This application relates to disc-type brakes incorporating shields which protect the piston and the boot from the effects of heat and mechanical abrasion.

It is important that such a heat shield be capable of transmitting the thrust of the piston against the backing plate without undue distortion, and provide mechanical and thermal protection for the elastomeric boot which surrounds the piston. Such boots have bellows-like convolutions which reside in close proximity to the backing plate of the adjacent pad, as shown in U. S. patent No. 3,800,923 issued April 2, 1974 to Rike.

The disc brakes of the present invention have heat shields of suitable material having both strength and low thermal conductivity, such as stainless steel or galvanized steel. Such shields are discs which may be carried directly on the face of the piston itself, such as by cementing or frictionally by lanced out tabs or portions on the shield which engage the piston. The discs extend radially from the piston and to an outer position which is somewhat outwardly of the adjacent convolution or fold of the annular boot, and provide a mechanical barrier and heat resistance path to protect the boot. The discs also turn away radiant heat from the piston and the boot, and are a thermal barrier which resists the conduction of heat from the backing plate to the boot and to the piston.

In certain embodiments the isolation between the piston cup and the heat from the adjacent backing plate can be improved by limiting the region or areas of contact of the disc with the cup or backing plate. This can take the form of cut-outs or grooves in the shield or piston cup, or coining of the disc to limit the extent of contact between the piston cup or the backing plate and the disc.

In summary, the invention is for a caliper-type disc brake which incorporates at least one piston cup which is slidably mounted in a caliper so that the open side of the cup faces the disc with an intermediate pad of friction material carried on a backing plate between the cup and the disc. The heat shield is characterized by a sheet metal disc which is carried on the open face of the piston cup forwardly of the convolutions of the dust boot, and which is positioned between the backing plate and the cup. The heat shield disc has an annular portion which extends radially outwardly immediately forward of the forwardmost exposed portion of the boot for protecting and shielding the boot from heat. The portion which is positioned between the open end of the cup and the backing plate also forms a heat barrier which protects the cup from heat generated frictionally at the friction material and transmitted through the backing plate.

In order that the invention may be more readily understood, reference will now be made to the accompanying drawings, in which:

Figure 1 is a sectional view through a caliper-type disc brake incorporating a heat shield according to the teachings of this invention;

Figure 2 is an elevational view of the shield of Fig. 1;

Figure 3 is an elevational view of another embodiment of a heat shield according to this invention;

Figure 4 is a view similar to Fig. 3 showing the shield of Fig. 3 assembled on a cup-shaped piston; and

Figure 5 is a fragmentary views of a further modification of the shield.

Referring to the figures of the drawing which illustrate preferred embodiments of the invention, a caliper-type disc brake is shown in Fig. 1. It is understood that the caliper brake will include a brake disc 10 against which pads 12 of friction material are applied. The pads 12 are in turn mounted on conventional backing plates 15.

Braking force is generated by a hydraulic actuator in the form of a cylinder housing 20 carried on or forming part of the caliper, and a generally cup-shaped piston or piston cup 25 carried within the cylinder bore 26 of the piston housing 20. Hydraulic fluid under pressure is applied to the space between the closed end of the cup 25 and the caliper housing, to force the piston cup to the left, as viewed in Fig. 1, against the adjacent backing plate 15.

The piston further is enclosed by a conventional, generally bellows-shaped boot 28. A nose portion of the boot 28 is carried in an outwardly opening circumferential groove 30 formed in the exposed forward outer portion of the piston cup 25, adjacent the open end thereof. The inner end of the boot may be captured within an inwardly opening groove formed on the housing or caliper itself. It will be seen in viewing Fig. 1 that the boot convolutions are conventionally in close proximity to the adjacent backing plate 15. The piston cup 25 as well as the boot 28 is subject to the effects of heat generated by the adjacent friction pad 12 as carried both by convection and radiation through the backing plate 15 to the piston cup 25. The boot at its forward convolutions and its point of attachment with the groove 30, is particularly subject to such heat.

Further details of caliper mounted disc brakes, to which the present invention pertains are shown in U. S. Patent No. 3,834,332 issued May 20, 1975 to Afanador, and U. S. Patent No. 3,800,923 issued April 2, 1974 to Rike, which show caliper housings employing cup-shaped pistons which are open

at their forward end and which directly contact backing plates of adjacent pads of friction material and which carry a convoluted encircling dust boot, between the pistons and the caliper housings.

In accordance with the present invention, a barrier shell in the form of an annular sheet metal disc 40 is carried on the open face of the piston cup 25, forwardly of the boot 28. The disc 40 is preferably formed of relatively thin high strength material, such as stainless steel or galvanized sheet steel has a relatively low coefficient of thermal conductivity. Yet, the disc 40 is of light weight and is fully capable of transmitting the braking force, between the piston 25 and the backing plate 15.

The disc 40 may be open in its center as shown in Fig. 1 and Fig. 2 or may be closed as shown in Fig. 3 and Fig. 4. It may have portions which grippingly engage the piston cup 25 so that the sheet metal disc 40 moves with the cup, or it may be cemented or bonded to the cup. In each embodiment, the disc 40 is provided with an annular or rearwardly offset radical portion 44. The portion 44 extends outwardly and adjacent of the forwardmost exposed portion of the boot 28 for shielding the boot from heat and abrasion generated by the adjacent friction pad and backing plate. And at the same time the disc 40 forms a thermal barrier which protects the piston cup itself and the hydraulic fluid therebehind from the effects of such heat. As noted, the portion 44 is offset somewhat away from the forwardmost face of the cup, to deflect the adjacent convolution of the boot away from the backing plate 15, thus defining a space 45 between the portion 44 and the plate.

Referring to Fig. 2, the disc 40 is annular and is formed with an open center. Three equally spaced and inwardly lanced tabs 46 form a frictional fit on the adjacent inside surface of the cup, as shown in Fig. 1. The shield as shown in Fig. 2 is formed with an outwardly extending annular offset portion 44 which extends in circumferential protective relation to the adjacent convolution of the boot 28 when a boot is assembled in the groove 30 of the piston 25. The shield or disc 40 of Figs. 1 and 2 is simply assembled onto the piston 25 by pressing, bringing the tabs 46 into frictional engagement with the inside surface of the cup.

A further embodiment of the disc is shown at 40b in Fig. 3. The disc 40b is radially continuous in that a central inside section 50 extends across the mouth of piston cup 25 and is in itself generally cup-shaped. A portion 50 may be provided with inwardly extending side walls 52 formed with lanced-out tabs 55, three in number, which frictionally engage the inside surface of the cup to retain the shield 40b in place.

The radially extending portion of the shield 40b is coined or embossed to provide the shield with an array or pattern of alternating elevated and depressed portions 56. The embossed portions 56 respectively contact either the open face of the piston cup 25 at the forward edge, or the adjacent surface of the backing plate 15, and limit the extent to which the shield 40b is in full contact with either the piston cup 25 or the backing plate. This reduces the effective areas through which heat may be conducted by metal-to-metal contact. Again, as shown in Fig. 4, the outer portion 44b extends radially outwardly of the outer dimension of the cup 25 and is somewhat offset rearwardly to provide for protection for the boot 28.

It is within the scope of the invention to attach the shield or support the shield on the cup at regions outwardly of the outer dimension of the cup, and a fragmentary view showing one such arrangement formed on a shield 40c is shown in Fig. 5, in which outwardly lanced tabs 65 are proportioned to engage the outer surface of the cup just outwardly of the boot groove 30. Three of the tabs 65 may be provided, in equally spaced relation, to grip or engage the cup at the outer region as shown.

The shield 40 is effective in that it can be made at very low cost. It can be coated with an elastomer or polymer or the like to reduce rattle or noise. It forms an air gap 45 between the cup and the backing plate, forms a radiation shield as well as a connection shield, for both the piston cup and the surrounding boot, increases the life of the boot by reducing the amount of heat subjected to the boot, and increases the brake efficiency by reducing the thermal load on the hydraulic fluid.

CLAIMS

1. A caliper-type disc brake incorporating at least one generally cup-shaped piston or piston cup slidably mounted in a caliper with the open side of said cup facing the disc and with an intermediate pad of friction material carried on a backing plate, and in which an annular dust boot surrounds the cup adjacent the open end thereof with one end of said boot being carried on said piston and another end of said boot being carried on the caliper with an exposed portion of said boot facing the adjacent backing plate, characterised by:

a sheet metal disc carried on the open face of said cup forwardly of said boot between the backing plate and cup, and said disc having an annular portion extending radially outwardly immediately forwardly of the forwardmost exposed portion of said boot for protecting said boot and shielding said boot from heat generated by said friction pad.

2. The brake as claimed in claim 1, further characterised by inwardly extending tabs engaging said cup adjacent the open end thereof.

3. The brake as claimed in claim 2, in which said tabs engage said piston on an inside surface thereof.

4. The brake as claimed in claim 2, in which said tabs engage said cup on an outside surface thereof.

5. The brake as claimed in any of claims 1 to 4, further characterised by coining between the cup and the backing plate limiting the areas of contact of said disc with the cup to reduce the regions for direct heat conduction from the backing plate to the cup.

6. A caliper-type disc brake substantially as hereinbefore described with reference to Figs. 1 and 2 of the accompanying drawings.

7. A caliper-type disc brake substantially as hereinbefore described with reference to Figs. 3 and 4 of the accompanying drawings.

8. A caliper-type disc brake substantially as hereinbefore described with reference to Fig. 5 of the accompanying drawings.

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